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Citation for published version:

Tingey, M & Webb, J 2020, *Net zero localities: Ambition & value in UK local authority investment*. University of Strathclyde Publishing. <https://www.energyrev.org.uk/media/1440/energyrev_net-zero-localities_202009.pdf>

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Publisher's PDF, also known as Version of record

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Net zero localities: ambition & value in UK local authority investment

Margaret Tingey & Janette Webb

September 2020



UK Research
and Innovation

Acknowledgements

We are very grateful to contributors who provided input and feedback on this research, your insights helped us improve this report: Abundance Investment Ltd; The Association for Decentralised Energy; Cambridgeshire County Council; Cultivate Innovation; Prof David McCrone; District Energy Development Ltd; Energetik; EnergyREV Research Consortium colleagues; Highland Council; Innovate UK; Leeds City Council; Local Energy Hubs (Greater South East; Midlands; North East, Yorkshire & Humber; North West; South West); Place-based Climate Action Network; Public Power Solutions; and UK100. The content of the report and any errors or omissions remain the responsibility of the authors.

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HEAT AND THE CITY

This report should be referenced as:

Tingey, M., and Webb, J. 2020. Net zero localities: ambition & value in UK local authority investment. Energy Revolution Research Centre, Strathclyde, UK. University of Strathclyde Publishing. ISBN 978-1-909522-59-6

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Cover image: Dr Grant Wilson, University of Birmingham.

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Executive summary

The UK is committed to development of a net zero carbon economy and society by 2050. In the energy sector, most progress has been made in decarbonising electricity; progress in energy efficiency, heat and transport is limited, and now urgent (IPCC, 2018; CCC, 2019; IEA, 2019a; BEIS, 2020a). These are all areas where local authorities have responsibilities and track records, but austerity in public finances, and lack of clear strategic direction from UK government, has limited their ability to plan and invest in net zero carbon localities. The 2020 coronavirus pandemic is now shifting the terrain of economic policy, with many governments turning to macro-economic models and fiscal policies for a renewed social contract where public services are investments rather than liabilities (Financial Times Editorial Board, 3rd April 2020). In this context, local authorities can be significant actors in a new economic normal geared to net zero emissions in buildings, heating and transport systems.

This Report discusses the multiple societal benefits and value of investing in UK localities and regions to meet net zero carbon objectives. It shows the major social returns from very affordable public investment. It outlines current Local Authority action on clean energy and energy saving, and considers changes needed for scaling up the contribution of local authorities to a net zero UK.

Key messages

Local Authorities are signalling ambition and political commitment to net zero, but little will happen unless there is central government support. Almost three quarters of UK local authorities have declared a Climate Emergency. Most set 2030 net zero carbon targets for their own operations and aim to extend outward to Net Zero Carbon Localities, with a clean energy system integrating heat, power, transport and storage at local scale, and reducing overall demand. Local political statements are a springboard for action, but fulfilling them requires support by Governments through new policy, powers and resources. Such support is a highly cost-effective way to secure a step change in progress.

There is opportunity to exploit the untapped economic potential of net zero carbon localities. Current investments across housing, public and commercial buildings, transport and industry are failing to capture major cost-effective carbon savings. Edinburgh's emissions, for example, could be reduced by around 55% from 2019 levels by investing almost £4 billion in measures which would payback over 7.5 years, and deliver annual financial savings of around £553 million (Williamson et al., 2019, 2020). The total annual energy bill for the whole of Edinburgh was around £823 million in 2019, meaning investment in cost-effective measures up to 2030 represents less than five years worth of the city's annual energy bill.

Decarbonising heat through low regrets options, such as low carbon heat networks, can be targeted. **If every UK local authority developed one average sized heat network in an area of high heat density and diversity of demand, this would represent an investment of over £5.6 billion in low carbon heat supply.** The current pipeline of heat network projects supported by BEIS (covering England and Wales) is £1.2 billion (BEIS, 2020b). The average heat network has capital expenditure of around £13.8 million (estimated to provide in the region of a 12km network with 2MW CHP capacity). Most are still in the planning phase, having not reached financial close. More directive policy could speed up development, where this offers best carbon and cost efficiencies.

Investing in people, skills and expertise can bring forward local net zero carbon programmes. Local authorities lack the resources to realise local climate action plans. However, European ‘technical assistance’ programmes have provided funds to establish local energy teams with demonstrated success in investment programmes. Across Europe €150 million has been invested in technical assistance through the EIB’s Elena programme to fund local energy teams (staff and project development activities), leading to €5.6 billion investment in local energy (EIB, 2019). Evaluations conclude that without funding local energy teams this volume of investment would not have come forward on its own (PwC, 2016; EIB, 2019). Ten European technical assistance programmes have been located in the UK, providing €23 million in grant funding which has delivered around €859 million investment in: energy efficiency in public buildings; district energy infrastructure; LED street lighting; solar PV; domestic energy retrofit; grid balancing services; EV charging and solar car parks. This represents prudent use of public funds: every €1 in grant aid delivers about €37 investment. To illustrate the potential, under a 1:37 investment basis, **£1 million technical assistance funding to every UK local authority could lead to over £15 billion in local energy investment.** There are clear, and negative, implications of Brexit for access to EIB funding; UK government needs to address these.

Local action needs to move beyond a project-by-project focus to systematic area-based programmes for retrofit of buildings, and delivery of local energy, circular economy and carbon stores in waters, forests and peatlands. Public investment has been geared to performance metrics and market incentives which focus on sector specific, short-term, results. Projects are frequently stalled or scaled down, with investment only in the most lucrative (Webb, Tingey and Hawkey, 2017). Better public value through collaboration in integrated long-term sustainable solutions has been marginalised (Webb, 2019a; Infrastructure Commission for Scotland, 2020). New thinking on affordable finance for local investment is now adopting a strategic approach to societal value from jobs, welfare, climate and economic resilience.¹

Progress on net zero localities needs new public procurement rules which prioritise carbon reduction. Public procurement currently prioritises lowest upfront cost. We need new net zero procurement tools, using whole-life costs, including embedded as well as operational GHG emissions. Existing local and regional capital expenditure on public infrastructure needs to apply net zero emission principles as part of UK-wide transformation. Net zero procurement provides clarity to businesses about the opportunity from transition.

Local Authorities are the key to realising the societal benefits from energy efficiency retrofit, green district heating networks, public transport and EV charging infrastructure, resilient local energy systems and carbon stores in waters, forests and peatlands. Investment in localities matters, delivering carbon, as well as financial, savings and improved welfare. Good local energy programmes will: pay for themselves; avoid higher cost investment in stand-by and electricity baseload elsewhere in the system; and open up economic and welfare opportunities from regeneration, supply chain and export potential. Net zero carbon localities can help reduce fuel poverty and energy bills, while improving air quality, health, employment, local resilience, socially just transition and biodiversity.

Recommendations

Wide ranging direct and indirect benefits of developing net zero carbon localities comprise a strong economic and societal case for investing. The following recommendations are aimed at guiding how UK, Scottish, Welsh and Northern Irish Governments can each convert local authority ambition into action. Section 6 contains further detail on each recommendation.

1. **Establish long-term policy objectives and instruments for net zero carbon localities.** Explicit long-term policy support for net zero localities, setting shared technical standards and guidelines, and devolving resources and responsibility for carbon budgets, will establish the principles for coordination between UK and devolved national, regional and local governments, and reduce uncertainties for businesses, investors and communities.
2. **Institutionalise local net zero carbon planning and implementation through statutory powers and devolved resources** to secure long term benefits from investment, and to develop coordinated local and national government action.
3. **Build capacity for integrated local programmes through investing in local authority net zero teams.** Provide long-term government funding for technical assistance and development capital to implement area-wide net zero carbon plans. Prioritise combining projects into local programmes to attract finance on acceptable terms. Back this up with regional and national coordination and support functions.
4. **Evaluate all public expenditure against net zero principles.** This requires new metrics to normalise and institutionalise governance for net zero carbon across local authority finance, land use planning, services and spending.
5. **Use government economic and industrial strategies post-Covid to drive investment in net zero carbon localities.** This can bring benefits from inward investment, high value jobs, skills, supply chains, improved housing and a just transition to net zero economy and society.

Net zero localities: ambition & value in UK local authority investment

Scaling up local energy through investing in technical capacity

Improved local capacity is essential to realising net zero carbon localities and regions. Technical assistance brings forward investments as well as improving the quality of projects.

£408 million

Technical assistance funding to every UK local authority → ■

£8.16 billion

Net zero Investment based on 1:20 ratio → ■

£15.1 billion

Net zero Investment based on 1:37 ratio → ■

Extending and accelerating heat network development

£5.6 billion

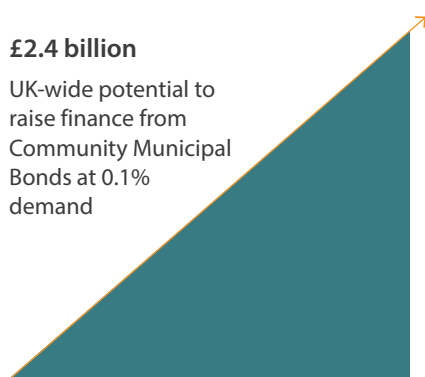
Developing one average heat network in every local authority, UK wide



Potential to raise finance from Community Municipal Bonds for local net zero programmes

£2.4 billion

UK-wide potential to raise finance from Community Municipal Bonds at 0.1% demand



Investment into local energy systems

€859 million

Low carbon investment delivered at local scale →

€23 million

Elena grant aid to fund people, skills & expertise →



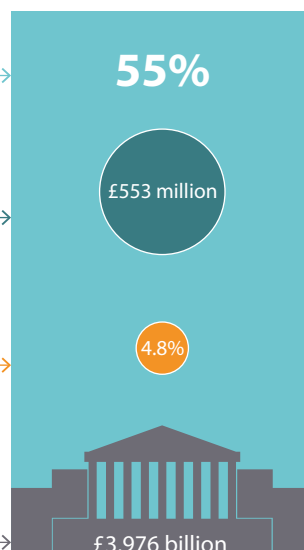
Edinburgh's emissions reduction potential

2030 carbon emission reduction compared to 2019 levels →

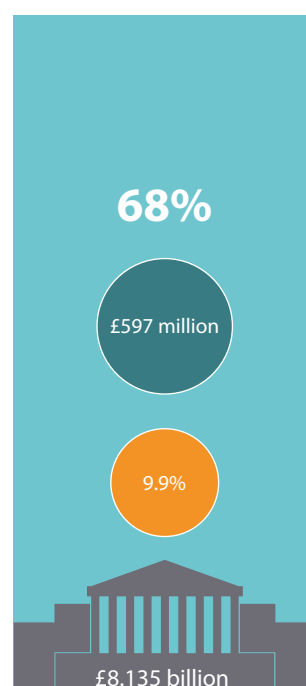
Annual financial savings →

Cost as proportion of 2019 city energy bill →

Cost from 2019–2030 →



Cost-Effective (CE)



Technical-Potential (TP)

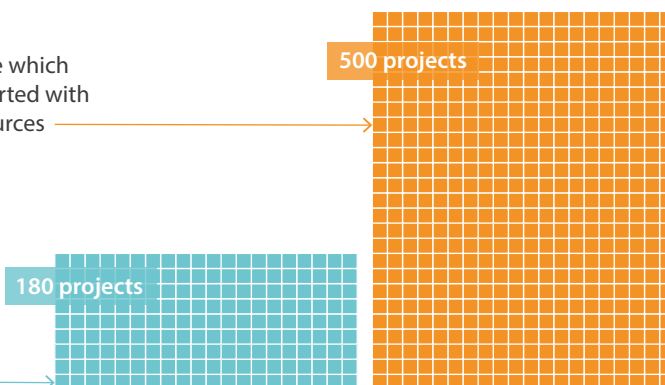
Potential of Local Energy Hubs project pipeline

£1.8 billion

Further pipeline which could be supported with additional resources →

£850 million

Current Local Energy Hubs pipeline →



Sources: BEIS (2020b), Eddington (2019), EIB (2019, 2020a, 2020b), HMRC (2019), Local Energy Hubs (2020), Williamson et al (2019, 2020).

1 Introduction: the value of net zero carbon localities to UK economy and society

This report discusses the multiple societal benefits of investing in UK localities and regions to act on net zero carbon objectives. We outline current local authority action on clean energy and energy saving, and consider changes needed for ramping up local scale activity. We showcase locally integrated energy system pilots, and identify the UK investment opportunity from local programmes. Evidence extends earlier research (Webb, Tingey and Hawkey, 2017) with new data and input from expert cross-sector contributors. Recommendations focus on how central governments in the UK can work with local and regional authorities to accelerate net zero economy and society.

UK, Scottish and Welsh Governments have recognised the necessity for radical change, making decarbonisation a major economic process (UK Government, 2017a, 2017b; Scottish Government, 2018a, 2019; Welsh Government, 2019). This requires action across all scales and sectors, going beyond energy to encompass repairing and extending carbon stores in waters, forests and peatlands, and moving to circular, zero waste economies (IPCC, 2018). This report focusses on the contribution of local energy to net zero.

Local Authorities are critical civic actors, able to manage the transition to a sustainable local economy and society, and trusted to engage with citizens and business through initiatives such as the Big Leeds Climate Conversation. They are the connective tissue between micro-scale small group action and macro-scale states and markets.² Local political statements signal the innovation, ambition and provide momentum. Since Bristol City Council declared a climate emergency in November 2018, almost three quarters of the 408 UK Local Authorities have followed suit. Most set 2030 net zero carbon targets for their own operations and aim to extend outward to Net Zero Carbon Localities covering the whole local authority area.³ These localities aim to use a clean energy system integrating heat, power, transport and storage at local scale, while reducing overall energy demand. A route to such local integration would be to combine spatial with energy planning powers to support integrated investment, but this needs changes in regulation and reporting.

Integrated local systems can reduce waste of local energy through incorporating storage (including thermal storage in heat networks), and provide flexibility services to the grid. This is expected to reduce the total cost of transition to a clean, affordable and secure energy system (National Infrastructure Commission, 2016), as well as benefiting local economies and welfare.⁴ Energy efficiency, heat decarbonisation and EV charging infrastructure are key to energy and carbon saving, increasing productivity, jobs and GDP (Nieto, Brockway and Barrett, 2019, 2020; Unsworth, Valero and Stern, 2020). The UK Industrial Strategy challenge *Prospering from the Energy Revolution* is testing the potential of localised systems to reduce GHG emissions below Carbon Budget 5 levels; reduce energy bills; contribute to energy security and resilience; and attract investment in high value jobs and expertise, all leading to supply chain and export opportunities. Investment in demand reduction also reduces the need for, and costs of, reinforcing networks, and building other expensive electricity generating infrastructure. 'Cost-effective' investment in domestic energy efficiency, heat pumps and heat networks could reduce UK household energy demand by around 25% (Rosenow et al., 2017), whilst improving home comfort and well-being. In Scotland, the Energy Efficient Scotland programme is structured around integrated national and local action to upgrade the entire building stock over 20 years; the Scottish Local Energy Policy Statement also positions local energy as central to a more people-centred, just, and inclusive net zero transition.

UK local authorities however lack the statutory mandate and resources to make current strategy for net zero feasible, and this has been exacerbated by austerity (Bawden, 2019). The Institute for Fiscal Studies concluded that among English local authorities, cuts in central government grants, increased pressure on social care budgets, and insufficient income from other sources such as business rates and council tax have led to a 17% decrease in spending on local services since 2009 (Harris, Hodge and Phillips, 2019). In Scotland and Wales local authorities face similar, albeit less severe financial pressures (Audit Scotland, 2019; Downe and Taylor-Collins, 2019).

Despite political commitment, local authority action remains mostly small scale and piecemeal, with high transaction costs and reliance on what one Council officer called 'wilful individuals'. In an uncertain policy context, local energy developments tend to stall due to perceived financial risks, and resulting higher cost of capital. We need instead to prioritise the societal case for investment (Hawkey, Webb et al., 2016), and most local authorities have developed corresponding energy and carbon management plans for their own operations; a smaller group have area-wide sustainable energy plans (Tingey and Webb, 2020) and/or more recent climate emergency plans which are now beginning to emerge in relation to Climate Emergency motions.

Bristol City Council was the first to declare a climate emergency in November 2018. Having identified – Bristol City Leap – an initial investment prospectus of more than £1 billion over 10 years, the Mayor published a responsive Action Plan in July 2019 to the climate emergency declaration, and the City's cross-sector partnership identifies the collaborative effort needed to become a carbon neutral city by 2030 in their One City Climate Strategy published in February 2020.

All initiatives signal the major potential for local net zero planning and investment, with relatively minor changes in public policy, which local statutory powers and resources could secure.⁵

2 The added value of local energy investment

Climate emergency political statements need costed plans and an implementation timeline for investment, with a clear signal to supply chains. Leading Local Authorities are developing such plans. This section exemplifies the resulting local energy initiatives across unitary, metropolitan, county, district boroughs and combined authority structures across the UK. Investment models reviewed in this report encompass local authority borrowing; leveraged investment for a pipeline of projects; combined public and private finance; and crowdfunding. Investments are addressing market failures in the low carbon sector, decarbonising the public estate, housing and the private sector, and delivering local public goods.

Each model shows the potential for aggregating, scaling up and replicating investment, providing foundations for locally-led net zero programmes. We know, however, that current initiatives are very far short of the cost-effective potential for local low carbon investments. Our analysis of 37 UK local energy investments (Webb, Tingey and Hawkey, 2017 p20), identified capital investment of £356 million.

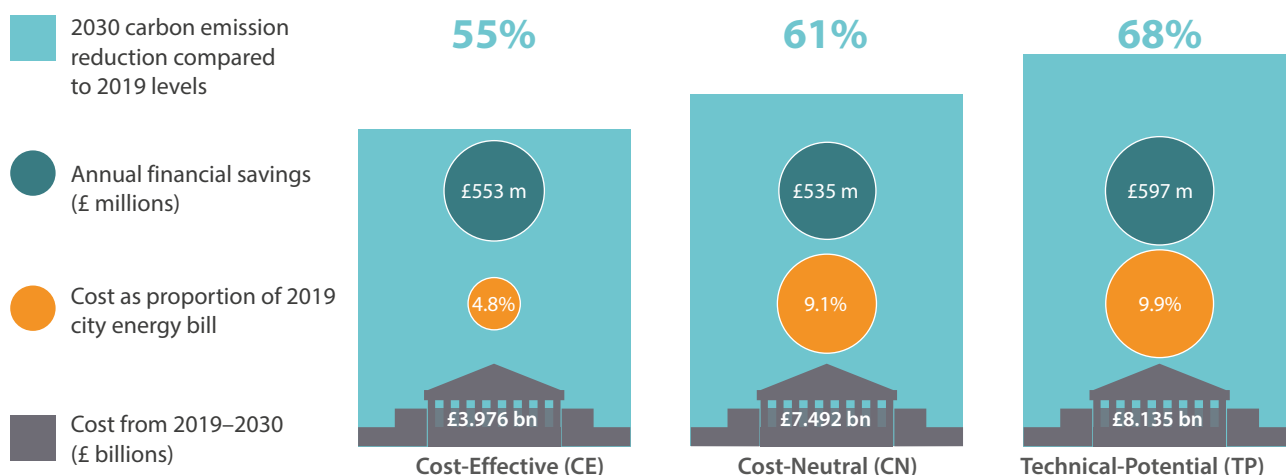
This is tiny, compared with the potential in a single city such as Edinburgh, where cost-effective carbon reduction investments in housing, public and commercial buildings, transport, industry and waste sectors up to 2030 are assessed as almost £4 billion (Williamson et al., 2020).

The total annual energy bill for the whole of Edinburgh was around £823 million in 2019,⁶ meaning investment in cost-effective measures up to 2030 represents less than five years worth of the city's annual energy bill.

Estimated average annual financial savings from such cost-effective investments are £553 million, with a 55% reduction in 2019 emission levels, and a payback of just over seven years (Williamson et al., 2019 p19, 2020 p13). These measures are estimated to cut the 2030 projected annual energy bill of the city by about two-thirds. Investing on a cost neutral or technical potential basis would increase carbon savings even further (Figure 1).⁷

Figure 1: Edinburgh's emissions reduction potential from investing in local energy.

Source: Williamson et al. (2019, 2020). Notes: Emissions include Scope 1 and Scope 2.



Equally, examining just one form of local provision – heat networks – project planning supported through the Heat Networks Delivery Unit (England and Wales) totalled £1.2 billion (October – December 2019). Projects worth £51 million are under construction, and £655 million potential is associated with the Heat Networks Investment Programme (HNIP).

Using available data we can establish a proxy measure of the average size of a heat network: of 54 projects where costs are available (BEIS, 2020b), combined capex is £745 million with a £13.8 million average⁸ (median £9.13 million).

Based on this, if every local authority developed one average sized heat network (at around £13.8m, estimated to provide in the region of a 12km network with 2MW CHP capacity),⁹ this represents an investment of over £5.6 billion in low carbon heat supply (Figure 2). This far exceeds both the current HNDU pipeline, and HNIP which ‘seeks to leverage around £1 billion of private sector and other investment’ in heat networks in England and Wales (BEIS and Triple Point Heat Networks Investment Management, 2019 p4).

This is likely to be a very conservative assumption about the potential for investment, given that most UK heat network development currently focusses on the ring-fenced opportunities for commercial returns on investment. Using a societal case, with social rates of return in line with Treasury Green Book guidance, can secure better carbon and cost efficiencies, serving more diverse heat loads and circa 50% more heat demand from a single heat source (Bush, Hawkey and

Webb, 2019). In some cities with high demand for heat and older buildings, multi-phase heat networks could be carbon and cost effective. Increasing investment in heat networks (which are heat source agnostic and can turn ‘waste’ heat from air, water and ground sources into a resource) could thus play a significant role in heat decarbonisation.

Supportive public policies could thus unlock cost-effective local low carbon investment on a major scale, contributing to fair and prosperous localities (see all 5 Recommendations). Existing financing and funding options, a selection of which are briefly reviewed below, need to be restructured to make this happen.

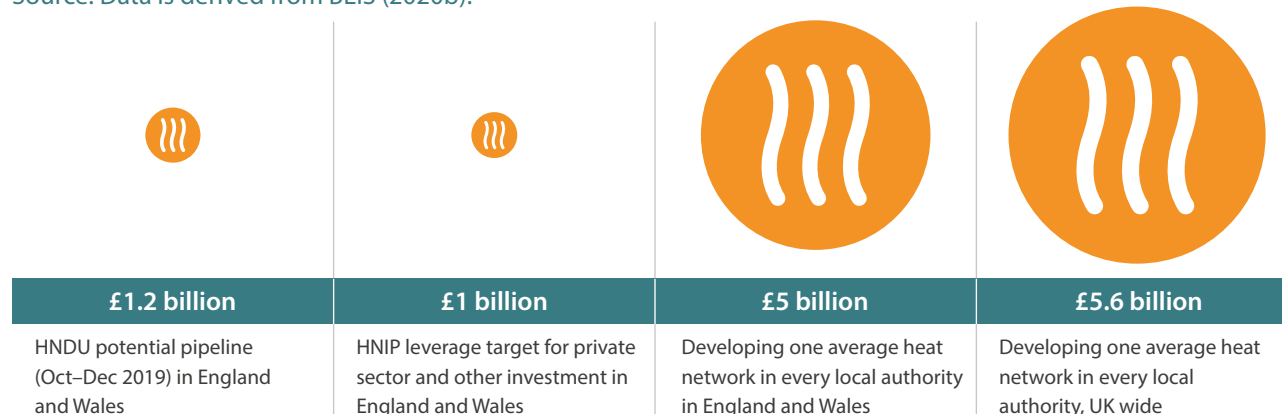
Established local authority borrowing options: Public Works Loan Board

The UK Government Public Works Loan Board (PWLB) is a straightforward source for local authority borrowing, subject to UK Treasury debt management principles of acceptable risk to the public purse and the prudential code. Due diligence costs are kept low, because unlike project-based finance, local authorities access PWLB in accordance with the prudential code.¹⁰

Local Authorities take different stances on PWLB borrowing, depending on circumstances such as the ratio of debt to reserves, and the level of risk in their portfolio. In principle however, the PWLB is an accessible route for local authority energy finance, and has been a key source of long-term loans for projects yielding a return, or savings to cover costs.

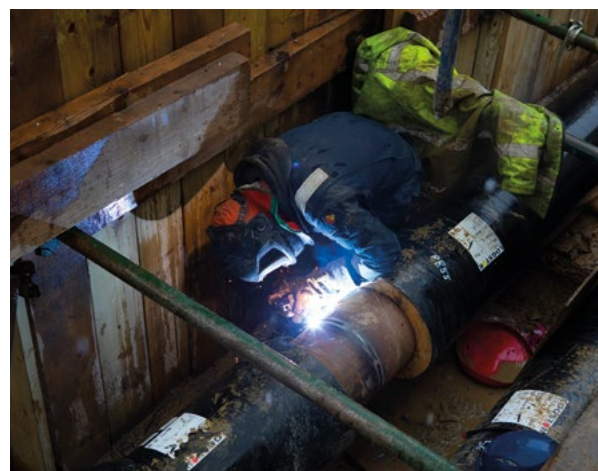
Figure 2: Decarbonising heat through rolling out heat network development.

Source: Data is derived from BEIS (2020b).



Leeds City Council investment in district energy combines PWLB finance with budgets and grants to develop integrated area based efficient energy schemes with multiple co-benefits. This local energy infrastructure investment contributes to cross-sector emission reductions and affordable energy, translating waste into a resource efficiency solution, and generating long term local revenues. It is a primer for locally-led net zero investment programmes.

Photo: Welder working on district heating installation in Leeds. Image courtesy of Leeds City Council.



Box 1: Leeds PIPES

Leeds PIPES (Providing Innovative Pro-Environment Solutions) heat network is a c£42 million investment comprising multiple sources of funding (£19.75m PWLB; £10m Housing Revenue Account; £5.8m ERDF; £4m Leeds City Region Growth Deal; and £2.4m HNIP funding), and utilising ‘waste’ heat from the Recycling and Energy Recovery Facility (RERF, operated by Veolia) at Cross Green to deliver low carbon heat and hot water to the city.¹¹

Integrating waste and energy strategy represents an important opportunity for councils to capture the benefits from decarbonising heat across towns and cities. However the risk profile and long term nature of the investment meant the heat network was unlikely to attract private finance on acceptable terms. With Leeds council directly investing and owning the network, the clean energy, carbon saving and environmental benefits are achieved alongside more affordable energy for residents; over the long term there is also potential to attract low cost private finance once the initial network is built and ‘de-risked’.

- Phase one commenced operations in April 2019 and phase two is due to be completed by autumn 2020. Phase one is owned by the council, with Vital Energi providing long-term O&M. To comply with HNIP funding rules, phase two will be an innovative PipeCo model, with the network owned and operated by a Special Purpose Vehicle (SPV) which will transport heat on behalf of PIPES and supply heat to customers.
- Phase one consists of around 16.5km of district heating pipework supplying nearly 2,000 council homes in 31 blocks as well as a commercial customer; phase two will add another 5km of pipework, connecting five major public buildings in the city centre. The network is oversized by design, and discussions about long-term heat supply contracts are taking place with existing building owners and developers.
- Heating buildings from the otherwise ‘wasted’ heat produced from the energy from waste plant (which itself produces electricity) is estimated to reduce carbon emissions by 11,000 tCO₂ per year once fully built, compared to gas or electric heating; residents also expect around a 10% reduction in heating bills from upgraded internal systems and smart meters.
- Leeds City Council has used its planning powers to require developers to connect to district heating where viable (EN4), which also helps developers to meet carbon reductions required by planning policies (EN1 and EN2). A Local Development Order gives permitted development rights to district heating utilities in specified areas, similar to those for other utilities.

Leveraging investment through technical assistance and development: EIB and EU funding

Two EU programmes, European Local Energy Assistance – **Elena**, and Mobilising Local Energy Investment – **MLEI**, provide a ‘technical assistance’ grant to employ staff to develop an investment pipeline over 3-4 years. In return, local authorities commit to leverage investment into energy initiatives according to an agreed target.

The smaller MLEI programme began under intelligent Energy Europe in 2011 and has continued under Horizon 2020: available data from 2016 (European Commission, 2016) showed a total of 28 projects across Europe delivering over €615 million investment in local energy. UK local programmes include Cambridgeshire, Oxford and Newcastle.

Elena, the larger of the two schemes, was established in 2009 and is led by the European Investment Bank (EIB) on behalf of the European Commission.¹² To date there are 103 local Elena programmes across Europe (37 completed; 66 ongoing): data is available for 85 of these, showing that €150 million invested in grants is leading to €5.6 billion investment into low carbon and energy efficiency projects (EIB, 2019 p15).

The UK has 10 local programmes (5 completed; 5 ongoing), and local authorities frequently utilise PWLB finance for initial project pipelines. Programmes (Table 1, see Appendix, page 36) have been solo, consortia and regional collaborations in successive bids (2 in Bristol and 3 in London), spanning major English cities and city regions (Birmingham, Bristol, Bristol city region, Greater Manchester, Leeds city region, Greater London), and unitary authorities such as Cheshire East in North West England. Local Partnerships has delivered an Elena programme for Welsh Government, rolling out the GLA’s RE:FIT energy performance contracting model for the public sector.

Investments have focussed on energy efficiency in public buildings, district energy infrastructure, LED street lighting, solar PV and domestic energy retrofit. Grid balancing services (Cheshire East), EV charging and solar car parks (South West and Cambridgeshire) have also featured.

Our analysis shows that technical assistance leads to major leveraging of investment into local energy systems: €23 million provided in Elena grants has delivered around €859 million investment in the UK programmes (Figure 3). This is benefitting around 180 local authorities and additional public sector organisations.

Figure 3: Leveraging investment into UK local energy systems.

Sources: Data extracted and compiled from individual local Elena programme factsheets (EIB, 2020a, 2020b).



The most ambitious leverage target¹³ for sustainable energy was €1 to €20; i.e. every €1 spent under the Elena Programme was expected to lead to €20 investment. However, every €1 has actually led to €37 in investment, far exceeding targets. The success of local programmes emphasises the significant impact of technical assistance capacities in unlocking clean energy investment at local and regional scale (see Recommendation 3).

Learning from the success of Elena, an injection of funding to local authorities would result in major progress in net zero plans and investment: using a 1:37 investment leverage factor, an illustrative figure of £1 million in technical assistance funding to every local authority, would represent over £15 billion in local energy investment (Figure 4). Packaging a local programme of projects could help secure finance from a range of different sources.

Although local energy investment might not be equally distributed across local authority areas, those already using this model have far exceed expectations, by almost double. Existing local energy teams based on this model have also secured additional investment beyond these figures. For example, across Europe almost two-thirds of beneficiaries retained a technical assistance delivery unit after their initial Elena grant ended, accruing at least €780 million in additional investments (EIB, 2019 p29).

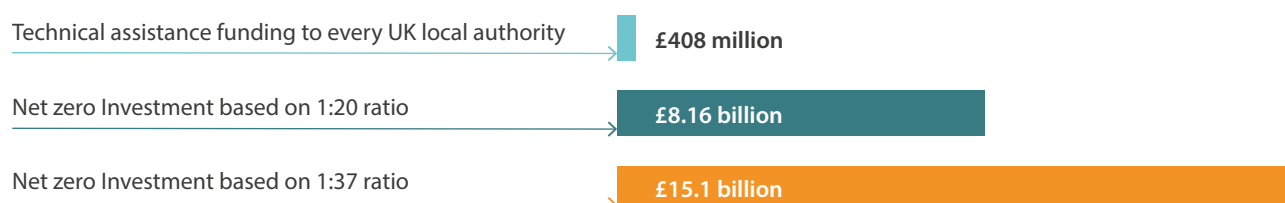
Technical assistance not only brings forward investments but also improves the quality of projects, saving more energy and carbon overall. This includes projects which would have otherwise been scaled down or not come forward (PwC, 2016). The investment is significant value for public money: '[technical] assistance accelerates investment decisions... [and] increases energy savings and reduces more carbon emissions per euro of investment' (EIB, 2019 p28).

Our analysis of the UK local programmes finds:

- annual reduction of 172,000 tonnes CO₂e across projects in nine UK Elena programmes
- annual energy savings of 443 GWh (nine local programmes)
- annual heat and electricity generation of 123 GWh (seven local programmes)

Figure 4: Scaling up local energy through investing in technical capacity within local authorities.

Sources: The ratios used here replicate the targets set by EIB for the sustainable energy category (1:20) and actual delivered investment ratio of the local Elena programmes (1:37) (EIB, 2019).



Box 2: Benefits from project development assistance

- Helping get projects off the ground: targeted technical assistance at local level provides competencies across technical and energy audits, business plans, financial and legal advice, procurement, project bundling, and project management, addressing the resource gap of development capital and technical expertise to develop projects. However, securing in-house legal and financial competencies is often challenging.
- Leads to aggregating projects: individual projects are often small scale, yet scheme design assists with packaging them (minimum investment level for Elena is €30 million; MLEI was €10 million).
- Replicating and scaling up after grant funding ends. Beneficiaries retaining a delivery unit after the grant ends secure long-term retention of skills and expertise. To illustrate the long term improvement of local capacity: RE:FIT energy performance contracting, first developed under a GLA Elena grant, has been rolled out to public sector bodies across the UK.
- Improving low carbon and energy efficiency supply chains: major investment in local projects builds local supply chains. However, evaluations also found limited responses to tenders indicating immature markets requiring upskilling and development.
- Ability to encompass a wide range of local energy technologies and projects: primarily targeted decarbonisation and energy saving across public estate, but could target area-based cross-sector net zero investment.
- Success based on demonstrable achievements: leverage factor, the ratio between the committed investment pipeline and the value of technical assistance grant, is used to measure success and are useful control and monitoring tools (PwC, 2016); a results-oriented approach stimulates investments and locks in local political commitment. However, more ambitious and innovative projects sometimes tend to be set aside in favour of straightforward projects guaranteed to meet the target within the 3-4 year timeline.
- Articulates local political commitment: requires senior champions and commitment from senior leadership across organisations, giving a high priority to local energy and its co-benefits.
- Recipients contribute: Elena funding covers 90% of technical assistance costs, with recipients contributing 10%; MLEI covered 75% of technical assistance costs.
- Central Elena team assists local delivery: Elena team based at EIB provide expert support to bring forward an investment pipeline and support recipients; a similar function is provided for MLEI and its successor.
- No application deadline: applicants approach EIB when they are ready to take forward a local investment programme. The application, auditing and documentation process is however complex and onerous, although this is by no means unique to the Elena and MLEI schemes.

Regional funds bringing institutional investors onboard: Mayor of London's Energy Efficiency Fund (MEEF)

MEEF is a £500 million fund investing in low carbon and renewable energy systems across Greater London. Amber Infrastructure, fund manager, also leads a £2 million technical assistance unit. Significantly, the Fund combines public and private investors and banks into a single fund: ERDF, GLA, Amber Infrastructure Group, Lloyds Bank, National Westminster Bank, Santander UK, Sumitomo Mitsui Banking Corporation and Triodos Bank. Their collaboration has created 'the UK's largest ever dedicated investment fund for urban energy efficiency measures' (GLA, 2018).

MEEF considers investments from £1 million for up to 19 years, primarily under senior debt, but also mezzanine debt and equity (see Amber Infrastructure, 2020). Investments must save at least one tonne of carbon for every £7,000 invested, or achieve a 20% energy saving. Eligible investments span energy efficiency, renewables, decentralised energy, storage, regeneration and EV charging: 70% of the fund is targeting local authorities, NHS, registered social landlords, education (higher and further) and third sector non-profits; 30% is available to SMEs and ESCos. Local authorities can borrow up to 100% capex costs with interest rates below the equivalent PWLB rate (Amber Infrastructure, 2019). By blending public and private finance, borrowing can be flexibly structured, including shorter term commercial lending and longer-term public loans. Overall MEEF aims to finance 17 MW renewable energy capacity and reduce carbon emissions by 37,000 tonnes per year (Patrick, 2018).

MEEF builds on the trajectory of Regional Funds (see Recommendation 5), providing revolving finance: the London Energy Efficiency Fund (LEEF) financed major projects including the Greenwich Peninsula heat network, renewal of Tate Modern, and St George's Hospital energy performance contract, and is now reinvesting through MEEF. The Scottish SPRUCE fund also has around £50 million of recycled finance for reinvestment following capital repayments from its original £80 million fund.

Box 3: The contribution of regional funding to local energy developments

The **Energetik** heat network (wholly owned by **Enfield Council**) for example is utilising LEEF and MEEF within two tranches of capital funding in 2017 and 2019 totalling more £42 million. Energetik is a phased heat network development throughout the borough and a major urban regeneration development at Meridian Water. The network intends to utilise otherwise 'wasted' heat from the Edmonton energy from waste plant. Using BRE's latest technical guidance (BRE, 2020) for calculating the carbon factor for heat networks served by energy from waste, Energetik estimates that compared to an individual gas boiler this will deliver a 92.3% reduction in carbon. Tranche 1 funding has brought together a £6 million LEEF loan with £6 million of EIB finance as part of a larger £80 million loan to Enfield Council; tranche 2 combines a £15 million MEEF loan with £15 million from the Heat Networks Investment Project (HNIP) finance comprised of a £5 million grant and a £10 million loan.

The majority of MEEF investments have focussed on energy performance contracting to upgrade buildings (primarily among local authorities and NHS organisations), with the advantages of pre-procured frameworks offering relatively quick and straightforward procurement. Other investments the MEEF investment pipeline aims to include are street-lighting, EV charging infrastructure and deep residential retrofit (Herlinger, 2019).

Financing platforms: crowdfunding municipal bonds

Government bonds have a long history, including in emergencies (Slater, 2018). Community Municipal Bonds (Davis and Cartwright, 2019) are a new variant for local authorities to invest in low energy, green and social infrastructure, and are expected to make investment more straightforward, accessible, and affordable.¹⁴ They are issued against the local authority covenant, resulting in lower due diligence costs than project finance, and expect to offer finance at lower than equivalent PWLB rates. A 2020 pilot¹⁵ is running with up to five UK local authorities and Abundance, a regulated UK finance provider. Institutional investor Legal and General are in discussions with Abundance to invest alongside resident investors to provide additional scale. The low threshold for investing (as low as £5) reflects the company's interest in everyone being able to make ethical investments. An online trading platform also allows people to cash in before the end of the term.¹⁶

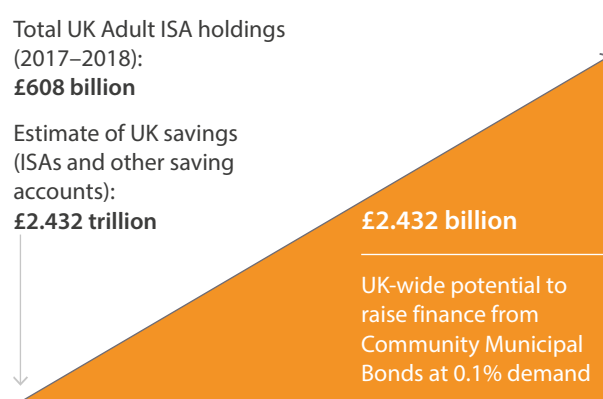
West Berkshire Council have set a carbon neutral target date of 2030; at the end of April 2020 the council voted in favour of issuing a 5-year £1 million community municipal bond (Abundance, 2020). The council estimates that the bond will provide capital at around 0.5% below equivalent PWLB rates. Proposals for the pilot bond primarily focus on solar PV but may include increased tree-planting (West Berkshire Council, 2020).

Personal saving accounts have received little attention as a model for community financed energy (Braunholtz-Speight et al., 2018, 2020), but estimates suggest considerable potential: Abundance estimates that if savers in the North West region invested just 0.1% of their total savings in community municipal bonds this would provide around £219 million for local investment (Eddington, 2019).

Using the same cautious baseline assumption of a 0.1% demand from savers, we can establish a UK wide estimate of how much could potentially be raised from community municipal bonds for local net zero investment programmes. Latest data on UK Adult ISAs showed subscriptions of around £69 billion in 2017-18, bringing the market value of Adult ISA funds to £608 billion (HM Revenue and Customs, 2019 p10-13). Assuming the same 0.1% level of demand would indicate around £608 million could be raised in an annual subscription (using 2017-18 levels) if community municipal bonds were eligible, and around £608 million from total Adult ISA funds. Total savings however are estimated at around four times Adult ISAs (Eddington, 2019), indicating over £2.4 billion could be raised from community municipal bonds for local net zero investment programmes (Figure 5).

Figure 5: The potential to raise finance from Community Municipal Bonds for net zero carbon localities.

Note: We use the same demand assumption as Abundance Investment (0.1% of total savings) though acknowledge this does not show whether savers are prepared to invest (see however, Davis and Cartwright, 2019). Alongside the Community Municipal Bond trail, further research is thus needed on this question.



3 Integrated local energy systems: prospering from the energy revolution

UK clean growth and industrial strategies (UK Government, 2017a, 2017b) provide investment for economic and industrial innovation. The £102.5 million **Prospering from the Energy Revolution** (PFER) challenge is supporting Smart Local Energy System Demonstrators and design consortia (2019–2022) to ‘deliver cleaner, cheaper and more resilient energy’ from integrated local heat, power, storage and transport systems (Innovate UK, 2019). The aim is to test the proposition that integrated local energy systems can reduce costly investment in grid reinforcement, and thus contribute to the ‘national interest’, while simultaneously securing local economic, environmental and social benefits¹⁷ (see Recommendations 1 and 5).

‘Whole system’ demonstrators in Orkney, Oxford, Oxfordshire and West Sussex exemplify cross sector collaboration, with matched public and private funds, for innovation.¹⁸

ReFLEX Orkney

Orkney’s renewable electricity generation has exceeded local use since 2013. The grid connection to the UK mainland also constrains export. These limit Orkney’s potential to support progress toward to net zero future. To solve this, ReFLEX (Responsive Flexibility) Orkney is aiming to optimise use of renewables through a ‘smart energy island’ concept. Distributed storage will enable demand side response, providing local flexibility across heat, power and transport: batteries can be charged when surplus renewable electricity is generated; when needed, stored energy can be discharged back to the grid.

An integrated energy system platform called FlexiGrid, designed by Solo Energy, will trade flexibility across energy balancing technologies including domestic and commercial batteries, electric vehicles charging points, electric vehicles and heating solutions. A local renewable electricity tariff will be introduced alongside direct purchase and leasing options to make these technologies available to householders and businesses.

The £28.5 million ReFLEX Orkney demonstrator (£14.3 million PFER funding and £14.3 private investment), is led by the European Marine Energy Centre (EMEC), with cross-sector partners including Aquatera, Community Energy Scotland, Heriot-Watt University, **Orkney Islands Council** and Solo Energy.

Energy Superhub Oxford

Energy Superhub Oxford (ESO) is connecting a large battery (50MW lithium-ion and 2MW vanadium flow) to the transmission network and electrifying local transport services and heat. It provides up to 25 MW of EV charging for council vehicle depots and around 100 charge points over a range of charging speeds for council vehicle and public use, whilst also supporting taxi electrification. This reduces stress on distribution networks whilst enabling system services through participation in the day ahead, intraday markets and balancing mechanism. Ground source heat pumps (GSHPs) intend to provide heating and hot water for up to 300 social rented (through several housing providers) and private homes; smart controls enable demand side management to lower heating bills by an estimated 25%, through time-of-use tariffs, and feedback on energy use.

The £41 million ESO demonstrator (£10 million PFER funding and £31 million private investment), is led by Pivot Power LLP (recently acquired by EDF Renewables), with cross-sector partners Habitat Energy Limited, Invinity Energy Systems, Kensa Contracting, **Oxford City Council** and Oxford University.

Project LEO

Within an already constrained distribution grid, Oxfordshire's ambitious 2030 emissions reduction targets require an additional 2,050 GWh of renewable electricity. Project LEO (Local Energy Oxfordshire) addresses this challenge via an ecosystem for maximising prosperity from local energy systems. This includes developing innovative funding models for new Distributed Energy Resources and demonstrating novel local energy markets.

Building on the Open Networks Transition Project, Project LEO emulates a Distribution System Operator model for active management of local networks. A local energy marketplace integrates and demonstrates aggregation; dispatch flexibility; and peer-to-peer trading across a wide range of different projects, technologies and locations within Oxfordshire. These projects span solar PV, hydropower, storage, heat networks, micro-grids, EV hubs and flexible loads.

The £35 million Project LEO demonstrator (£13 million PFER funding and £22 million private investment), is led by Scottish and Southern Electricity Networks, with cross-sector partners EDF Energy, Nuve, The Low Carbon Hub, Open Utility, Origami Energy, Oxford Brookes University, **Oxford City Council**, **Oxfordshire County Council** and Oxford University.

SmartHubs

SmartHubs will offer resilience through integrating electricity, heat and transport services within West Sussex. Supported by **West Sussex County Council**, it will deploy a Virtual Power Plant, aggregating and optimising a large number of different systems to deliver low cost, low carbon energy to local communities. Air source heat pumps optimised to reduce heating bills, will provide heating and hot water for up to 250 social and private domestic properties. A 12 MW large scale battery energy storage system will offer a wide range of in-front-of-the-meter services and revenues. Around 250 commercial, social and private housing and school sites will benefit from a combination of technologies including solar panels, small scale battery storage and EV charge points. Finally, a 2 MW electrolyser will facilitate on-site hydrogen generation for the refuelling of fuel cell electric vehicles. This will provide a clean fuel alternative, decarbonising transport fuels and improving air quality.

The £30 million SmartHubs demonstrator (£11m PFER funding and £19m private investment) is led by Connected Energy, with partners (ICAX, ITM Power, Moixa Technology, Newcastle University and PassivSystems) across the clean energy market, and an innovative local authority: **West Sussex County Council**.

West Sussex County Council is leading the £11.6 million investment in energy storage at a disused waste and recycling site. Using second-life batteries from electric vehicles, electricity is bought and stored when prices are low and sold back to the grid when demand is high. After accounting for replacement of inverters, and renewal of the second-life battery fleet every 8 years, Halewick Lane battery storage will provide the council with income of around £29 million over 25 years, including £960,000 in the first year. An £8 million hybrid electric/gas district heating network for Shoreham Harbour (Adur District Council) is also in development. A 2 MW marine source heat pump and 320 kW gas CHP engine will serve the Old Customs House site; two further phases of network expansion are envisaged.

Box 4: Smart Local Energy Systems: Detailed Designs

Ten smart local energy design consortia are also supported with the backing of £21 million from PFER. The projects are tasked with delivering the following benefits when implemented:

- Reducing energy bills by a minimum 25%
- Attracting at least 10 times more investment (compared to business as usual)
- Reducing energy emissions (below Carbon Budget 5 levels) in the target area, with a net zero emissions trajectory
- Improving energy security and resilience, and local energy system efficiency and productivity
- Creating high value local jobs, smart energy expertise, UK supply chain growth and export potential

The GreenSCIES (Green Smart Community Integrated Energy Systems) consortium is building on **Islington Council's** Bunhill district energy network. Planned 5th generation district heating is intended to integrate waste heat from multiple sources (offices, data centres and the London Underground¹⁹) with renewables and storage, to manage energy across the network. The system will also provide EV and eBike charging, export to grid, vehicle-to-grid, and other flexibility services. GreenSCIES estimates carbon emission reductions of 80%, compared with conventional systems, and expects to develop systems in Islington and Sandwell (West Midlands).



4 Central Government: action to unlock investment in net zero carbon localities

“...The greatest capacity to shape our energy destiny lies with governments. It is governments that set the conditions that determine energy innovation and investment. It is governments to whom the world looks for clear signals and unambiguous direction about the road ahead.”
(IEA, 2019b p6)

UK Government advisers estimate the costs of decarbonising our economy are likely to be 1-2% of GDP in 2050 (CCC, 2019). The UK Treasury's Net Zero Review is now establishing how the costs can be met and shared across society. The Review, due for publication in Autumn 2020, is 'setting out principles to guide decision-making during the transition to net zero' (UK Treasury, 2019). Transport, business and residential sectors all have significant local dimensions. Together they account for two thirds of greenhouse gas emissions (BEIS, 2020a).

UK Government has a unique opportunity to use existing and new public investment to create net zero towns, cities and rural areas that are prosperous, healthy and enjoyable places to live and work (Eyre and Killip, 2019; J. Watson et al., 2019).

Uncertainty over the future replacement of European funding streams post-Brexit, and recovery from the 2020 coronavirus pandemic provide the critical moment to integrate net zero emissions in buildings, heating and transport systems into economic strategy (see Recommendations 1 and 5).

Targeted public investment will benefit productivity, welfare and GDP (Nieto, Brockway and Barrett, 2019, 2020). Unsworth, Valero and Stern (2020) for example suggest that the current UK Government can meet its manifesto commitments by: first, investing £6.3 billion in decarbonising heat in buildings; second, using the £28 billion announced for roads to leverage private sector investment in EV charging; and third, utilising £800 million to mobilise private investment in carbon capture and storage.

Current low carbon public finance supports incremental carbon reduction on the public estate, but is inadequate to meet infrastructure needs for the whole local authority area.²⁰ For example, since its establishment in 2004, Salix Finance interest free loans to the public sector total £842 million, in almost 18,000 projects (Salix Finance, 2020).

Annual financial savings are in the region of £181 million, with emissions' reduction more than 820,000 tonnes CO₂e. **Highland Council** for example, is investing £7 million in energy efficiency upgrades on the corporate estate, using a recycling fund comprising £3.5 million of Salix Finance, match funded by the Council. Overall, however, such funds support straightforward projects with short payback (A. Watson and Cultivate, 2019).

These investments are insufficient to meet net zero ambitions which require a low-cost long-term and systematic investment programme, backed by government (Green Finance Taskforce, 2018; Robins et al., 2019).

Clear Government leadership and policy, including direct public investment is critical to unlocking finance from institutional investors, social and green investors, and community investors.

A more holistic approach is essential to the transformation of local, regional and national energy systems that contribute to net zero economy and society (see all Recommendations). Key central government actions for net zero carbon localities are outlined below.

Existing public expenditure

All local economic, spatial, transport and development planning now needs to apply net zero decision making principles (ClientEarth, 2019; Infrastructure Commission for Scotland, 2020). Local authorities' own spending – which accounts for over 20% of public expenditure – is key. English local authorities' 2018-19 total revenue expenditure is budgeted at £95.9 billion. In previous years, total procurement expenditure has been around two-thirds of total revenue spend and capital expenditure for roads, housing, schools, public facilities and street lighting has been about a quarter (MHCLG, 2019a). Local infrastructure expenditure and public procurement are hence major routes for local authorities to shape supply chains and markets, using tenders aligned with net zero carbon and energy saving principles on a whole life cycle basis. Changes in public procurement rules and guidance for net zero evaluation are urgent and essential (see Recommendation 4).

Net zero carbon at city scale

Estimates of the potential for city scale investment, across buildings, transport and waste sectors in Edinburgh (p10) suggests considerable opportunities to secure reductions in carbon emissions over a 10 year period from cost-effective investments. Co-benefits for air quality and fuel poverty amelioration should make the economic case even more appealing for policy makers (Sudmant et al., 2016).

These 'cost-effective' emission reduction measures are not however proceeding. Public investment is too siloed to deliver integrated solutions (London Sustainable Development Commission, 2020), and uses counterproductive performance metrics that marginalise necessary regional collaboration (Infrastructure Commission for Scotland, 2020). Projects are frequently scaled down (Webb, Tingey and Hawkey, 2017), with the financialising of city assets promoting a narrow short-termist calculation of value (Webb, 2019a). **Stoke on Trent's** integration of heat network development into its City Deal plans illustrates the potential for prioritising low carbon investment, but this remains discretionary: City Deals have not consistently targeted carbon reduction.

The criteria for infrastructure spending need to be changed to prevent short-term 'cherry picking', and to require a whole-systems assessment of societal value from infrastructure investment across residential, commercial, industrial and transport sectors. Projects need to be aggregated into local programmes to avoid selective investment in only the most lucrative opportunities, and to ensure that more attractive projects can cross-subsidise those with lower returns.

Financing for a Future London (London Sustainable Development Commission, 2020), for example, estimates that a net zero London requires £1-1.7 trillion of private investment, alongside public. To address institutional failures, recommendations centre on establishing a London Future Financing Facility to coordinate investment via mechanisms to de-risk and aggregate projects, issue bonds, pool public funding, and enable citizen financing.

Technical assistance is needed to bring developments forward, including supply chain innovation and training, with opportunities for skilled local jobs, and opening up clean energy markets.

Economic development for net zero: the Towns Fund

The UK and devolved national Governments can trigger net zero carbon investment at local scale by reorienting economic development funds. Under the Towns Fund²¹ for example, 100 English towns are invited to secure local investment ‘deals’ up to £25 million, with £3.6 billion total available ‘to drive the economic regeneration of towns to deliver long term economic and productivity growth’ (MHCLG, 2019b p9).

The Greater Grimsby Town Deal was the first, agreed in 2018; the full round is expected to be secured during 2020-2021. At present however, as with City Deals, integration of net zero into the overarching economic agenda is poor:

“ Investment from this fund should be aligned with the government’s clean growth objectives where possible, while ensuring that projects deliver good value for money, and as a minimum must not conflict with the UK’s legal commitment to cut greenhouse gas emissions to net zero by 2050.”
(Towns Fund Prospectus, p22)

To ensure economy recovery on a net zero trajectory, this objective should be strengthened to ensure all investments contribute to net zero emissions, and Town Deals are developing requisite skills and supply chains. The benefits will accrue not only locally, in terms of skilled jobs and sustainable places, but also across the UK through capacity building for resilient, prosperous economy and society (see Recommendations 4 and 5).

There is also a broader question about models for public investment in clean infrastructure. For example, Local Growth Deal funding is delivering over £9 billion investment between 2015-2021. However, questions were raised by both the National Audit Office and the Public Accounts Select Committee about how effectively local economic growth has been boosted, and about the capacity of Local Enterprise Partnerships to deliver funding (see Ward, 2020). In addition to integrating net zero, the technical skills and expertise to make best use of the funding need development (see Recommendations 2 and 3).

Net zero through the Shared Prosperity Fund

Future funding must invest in net zero infrastructure, skills and supply chains. The Shared Prosperity Fund is replacing EU structural funding following UK withdrawal from the European Union. During 2020 the UK Government is expected to develop Fund principles, creating an opportunity to pivot toward inclusive net zero carbon local economies.

A key issue is the scale of funding (Brien, 2019), with suggestions that this should increase relative to EU structural funds (APPG, 2019). Decision-making autonomy of devolved government has also been priority issue raised by Welsh Government (see Brien, 2019), as has a greater role for local authorities in deciding local priorities, under a long-term funding cycle of at least seven years. There is also potential to align with Local Industrial Strategies for low carbon investment (Bulleid et al., 2019); to simplify financial management; and to open up routes for local civic involvement (Henry and Morris, 2019).

5 Local Government: catalyst for net zero carbon localities

Net zero necessitates renewal of local and regional government capacities to manage the organisational change and innovation needed. Despite widely shared local political ambition, there is no clear consensus across UK governments about the potential for, or best way to create, local capacities and capabilities for net zero carbon. Given the centralised powers of UK, and devolved national, governments compared to other European countries, this section outlines the value of devolving more powers and resources for regional and local leadership of sustainable, circular and net zero economies (Webb, Tingey and Hawkey, 2017; Tingey and Webb 2019, 2020).

New statutory powers and resourcing for net zero at local scale

All UK local authorities are governed by statutory powers with little scope for local autonomy (Ladner et al., 2015; Eckersley, 2016; Webb, 2019b; Kuzemko and Britton, 2020). Most importantly, local authorities have no direct energy, or carbon budget, mandate or resources to ensure systematic action for net zero. Local government is fully devolved to the Scottish, Welsh and Northern Irish parliaments. Despite initial expectations, at least in Scotland, that further devolution of powers to local scale would ensue, no significant change has occurred. Reforms of English local government powers and resourcing, including greater 'in principle' discretion through well-being powers and devolution deals, have not fundamentally changed capacity to act. Subsequent English regional devolution has been uneven, non-transparent and tied to specified outcomes with limited local strategic control (House of Commons Committee of Public Accounts, 2015; National Audit Office, 2017; O'Brien, O'Neill and Pike, 2019).

Indirect mandates, such as those within spatial planning policy, are unevenly implemented (ClientEarth, 2019), and insufficient for the scale of strategic and coordinated local net zero investment required. This is particularly apparent in the context of austerity and local trade-offs between priorities such as affordable housing and clean energy. Integrating net zero energy planning and local spatial planning (in alignment with new national planning policies) is one potential step forward, but requires commensurate regulatory change and resources (Cowell and Webb, 2019).

Austerity measures have resulted in a highly uncertain future for all but essential statutory local services. Although systematic data are lacking, there is some evidence that dedicated energy manager and environment officer posts have either been merged with other roles as part of cost saving attempts or cut altogether (Webb, Tingey and Hawkey, 2017; Tingey and Webb, 2020). In England, local income from business rates and council tax is not keeping pace with service demand. Combined with cuts to central funding and increasing pressures on social care budgets, this has led overall to a 17% drop in spending on local services since 2009 (equal to about 23% per person, Harris, Hodge and Phillips, 2019 p6). The pattern of diminishing central budgets and upward pressure on local government finances is similar in Scotland and Wales, albeit less severe (Audit Scotland, 2019; Downe and Taylor-Collins, 2019).

Thus, despite local political commitment, local authority action depends on formal institutional change. Central and devolved national governments have a critical role through **new local statutory powers and resources for net zero carbon** planning and investment across energy, housing, transport, industrial and digital infrastructures (CCC, 2012; Friends of the Earth, 2019; House of Commons Science and Technology Committee, 2019). Implementation can be phased over a timeframe compatible with UK carbon budgets, with local flexibility to advance net zero targets ahead of UK deadlines (see Recommendation 2).

Changes in statutory powers can be politically controversial. Views differ about whether such powers hinder local discretion, including issues of ringfenced budgets. It is therefore critical that any new local net zero powers are democratically agreed, are developed through collaboration between local authorities and the respective central governments, and have commensurate financial and policy or regulatory support. This establishes two-way coordination between UK, national and local energy system planning and development. For regional coherence in line with UK carbon budgets, strategies and implementation need cross-sector input, including from major energy users and infrastructure bodies (e.g. transport), DNOs and publics.

Additional long-term resources are essential to ensure that local statutory net zero powers are more than 'box ticking' exercises with a short-term lowest-cost route to compliance. New political, legal and financial capacities are needed by local authorities to develop plans and to assess finance options for implementation. Such resources are needed to establish long-term legitimacy of local net zero governance, to drive structural change and to create a coherent problem-owner. Devolving responsibility for carbon budgets also requires answers to questions about how local authorities can influence other actors. Developing net zero accountability across the whole public sector is an important interconnecting action (see Section 4 and Recommendation 4).

Stable policy measures with clear timetables and multi-year funding help local authorities to channel resources and avoid frustrations from repeated need for improvisation in ad hoc local energy developments. Regional functions would aid coordination and local delivery. One potential model is to extend the Local Energy Hub pilots in England (see below), and to link these with national net zero agencies coordinating action and resources.

Climate legislation has facilitated Local Authority activity, especially in Scotland where the Climate Change Act (2009; 2019) requires all public bodies to act in the way best calculated to contribute to emissions reduction. Scottish social housing standards, and continuing public funding for area-based energy efficiency programmes, have resulted in more consistent progress on energy efficiency than in England (Webb, 2019b). Whilst there is unlikely to be a single model for local net zero development which works everywhere, we know from European practice that coordination across local, regional and national governments, as well as specific powers for energy planning, supportive regulation, and affordable finance are all critical to energy systems with a strong municipal component (Webb, Tingey and Hawkey, 2017). In the context of Brexit, and the coronavirus pandemic, radical change in UK governance may well occur; in the short term, however, a **devolved energy regulatory and tax framework is likely to be fundamental to governance for net zero carbon localities**. This is beginning to be explored in recent UK National Infrastructure Commission (2020a, 2020b) publications and by the Infrastructure Commission for Scotland (2020), and needs to proceed through consultation between UK and devolved national governments.

Box 5: Benefits of enhancing local capacities for net zero strategy and implementation

- Packaging individual project investments, under a single local strategy, lowering transaction costs and creating clarity on opportunities over implementation time period.
- Offering a route map for net zero business models at local scale.
- Integrating net zero into local governance framework reduces perceived political and financial risk of previously 'non-core' local authority activities.
- Increasing the local pace and scale of cross-sector deployment of clean energy stemming from mapping of opportunities, and plans for integrated local systems which minimise both cherry picking of lucrative schemes and asset sweating.
- Creating a trajectory for implementation at local scale over a timeline compatible with UK 2050 net zero targets.
- Enabling cross-border synergies and collaboration such as sharing resources, increasing purchasing power to reduce unit costs, and securing energy from waste and local heat supply within city regions and larger geographical areas like The Borderlands, spanning South of Scotland and North of England.
- Creating regional and national coherence and coordination across plans and investments at local level.
- Understanding constraints requiring regulatory change.
- Improving local capacities by learning from more advanced local authorities and levelling up ambition.

These benefits are derived from the evidence assembled for this report.

Proposals for local statutory powers in Scotland: Local Heat and Energy Efficiency Strategies

In 2015, Scottish Government defined energy efficiency of the building stock as a national infrastructure priority; local energy planning and implementation powers are being examined. Proposals include a new local authority statutory power to develop comprehensive area-based Local Heat and Energy Efficiency Strategies with a costed and prioritised 20 year implementation plan (Scottish Government, 2017, 2018b, 2019).

There is universal support among officers for new statutory powers, but there is a need for: additional technical and project management skills and resources; clear long-term financing strategies; accurate data on energy use; a platform for data sharing; and national-local coordination, accountability and review (Wade et al., 2019). At political level, the cross-scale and cross-party negotiation is challenging, but pilot projects are providing foundations for workable policy.

Building on local and regional scale strategies and implementation: learning from English Local Energy Hubs pilots

In 2018, UK BEIS Local Energy Team established five English pan-regional Local Energy Hub pilots. Up to March 2020, £6.3 million in core funding has supported a three-year programme with 38 staff. Each Hub is tasked with advancing a pipeline of local energy projects through supporting local authorities, other public sector organisations and industrial businesses within the geographical area. Although at an early stage, the Hubs are experimenting with different approaches reflecting the needs of their areas.

Support and technical assistance spans: development support, including feasibility; business case development and assistance in accessing funding and procurement; identifying opportunities for scaling up through shared project delivery; and aggregating projects to attract private sector investment. The Hubs also now administer the £10 million English Rural Community Energy Fund as a regional grant programme.

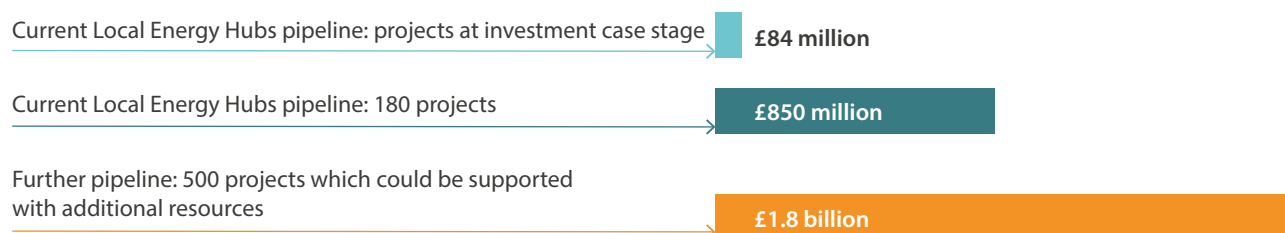
The Local Energy Hubs have a pipeline of 180 projects valued at £850 million for direct support and over half of this is identified as potential private sector investment. Of this pipeline, to date the Hubs have helped finalise the investment case for projects totalling £84 million. Across the Hubs, the project pipeline mainly includes renewable energy generation, district heating and building estate efficiency, but the Hubs have also assisted in investment cases for: energy strategies for major developments; ULEV fuelling; smart grids; and grid reinforcement. A further 500 projects already identified by the Hubs have an estimated value of at least £1.8 billion (Figure 6).

The pan-regional coverage of the English Local Energy Hubs is intended to align with national clean growth policy and to enable the delivery of LEP Energy Strategies.²² This has however led to considerable divergence in coverage of the nine English regions by the five Hubs (Kuzemko, Britton and Tingey, 2019): the Greater South-East Hub, for example, covers 149 local authorities and eleven LEPs; while the North West Hub spans 41 local authorities and five LEPs.

In consultation with English local authorities, LEPs and key businesses such as DNOs, UK Government now needs to establish the long-term net zero remit of the Local Energy Hubs in ramping up local and regional scale action on net zero. Those Hub projects at advanced 'shovel ready' stage can be immediately integrated into economic recovery funding following the corona virus pandemic.

Figure 6: Realising the full potential of the Local Energy Hubs project pipeline.

Source: Data were provided by the Local Energy Hubs.



6 Recommendations

The challenge and opportunity of net zero necessitates mobilising all scales of government and sectors. Local energy actors spanning public, private, social enterprises and citizens are all important, but UK and devolved governments in Scotland, Wales and Northern Ireland need to open up routes for locally-led innovation. Where local authorities already have plans and projects, governments can harness their momentum by providing the essential institutional powers and resources, backed up with national policy and regional support. These recommendations are a basis for consensus-building across scales of government for a net zero UK.

1. Establish long-term policy objectives and instruments for net zero carbon localities

National governments have essential policy and regulatory powers for societal and economic decarbonisation. Such powers set the trajectory, and scope for investment across scales and sectors. A key government function is socialising the costs and benefits of transition to net zero, including principles for equitable shares of uneven costs in different places to ensure distributive justice and ameliorate poverty. Coordination across UK, devolved national and local governments is needed to specify the intended co-benefits from net zero carbon localities for UK energy, built environment and transport systems. This needs to include explicit and consistent long-term policy, technical standards and guidelines to support low-regrets local investment in district heating, energy efficiency improvements in existing buildings, zero carbon new buildings, and clean public transport. Ambitious central government policies will in turn support long term economic opportunities from net zero.

2. Institutionalise local net zero carbon planning, strategy and implementation through statutory powers and devolved resources

Integrating net zero carbon powers into the local governance framework and service delivery is a significant route for local scale action. The Committee on Climate Change (2012), House of Commons Science and Technology Committee (2019) and Friends of the Earth (2019) have already recommended new statutory powers; in Scotland proposals include introducing Local Heat and Energy Efficiency Strategies into the statutory remit of local authorities. Governments need to work with local authorities to move beyond the need to justify local energy investments as filling budget gaps for social care, to stimulate locally-led strategic net zero programmes. This can be used to secure long term benefits from investment, and to develop coordinated local and national government action.

Local net zero investment is essential to long-term prosperity and resilience, and hence central to economic strategy and to a council's own capital investment programme; it needs to be a priority and responsibility of senior management and chief executives, and championed by political leadership backed with cross-party support.

Key considerations for net zero carbon plans and implementation include local systems integrating heat, power, transport and storage with spatial planning and digital infrastructures. The local authority remit should include:

- the ability to zone areas for specific heating systems where appropriate;
- the obligation, in designated heat network areas, to connect public buildings first, followed by larger commercial and domestic heat loads as buildings are refurbished;
- powers to support area-based high standards of energy efficiency retrofit in all buildings;
- greater synergy between planning and building regulations;
- and standard requirements for active engagement of gas, electricity and heat network operators with local/regional authorities to ensure coherent regional and national progress.

3. Build capacity for integrated local programmes through investing in local authority net zero teams

Building on the success of European-funded technical assistance programmes, where every €1 of local assistance led to €37 investment, UK Government should now invest in the necessary people and expertise for local solutions.

Investment in local authority net zero teams should be long-term, associated with statutory (or equivalent) commitment for net zero localities, and developing expertise in: capital financing for energy for net zero investments; local authority-wide procurement strategies; legal and contracting responsibilities; and clean infrastructure including heat, power, transport, waste, as well as carbon stores such as forests, to support a circular economy.

Local authorities should be offered opportunities to combine technical assistance resources. This should be backed up with regional and national coordination and support functions.

Professional training for net zero emissions economy and society should be developed with local authorities, chartered institutes (such as CIPFA) and sector specialists, as well as enhancing opportunities for local authorities to learn from each other.

4. Introduce net zero accountability across the public sector, including evaluating all public expenditure according to net zero principles

Public expenditure needs to lead by example, ensuring compatibility with a net zero trajectory. Central governments should work with local authorities and the public sector to establish new evaluation methods, along with a route map, for net zero public investment. Decisions need to be embedded in updated UK Treasury Green Book guidance. Consideration also needs to be given to devolving carbon budgets to local or combined/regional authorities, alongside commensurate powers and resources. Procurement procedures²³ need to be revised accordingly for options evaluation on a whole life-cost basis. New guidance on tender specifications and evaluation metrics should be developed alongside professional training. This would also benefit net zero supply chain development.

5. Use government economic and industrial strategy post-Covid to drive investment in net zero carbon localities

A concerted focus on investment in low carbon economic and industrial sectors would address market failures, drawing in more private finance. In return, government can expect benefits from inward investment, high value jobs, skills, supply chains, improved housing and a just transition.

Actions include customising the UK Guarantees Scheme, for 'nationally significant' schemes, for local scale net zero investment; co-investing in funds for local programmes, such as the £500 million Mayor of London's Energy Efficiency Fund, and using fossil fuel divestment strategies to draw in institutional investor and pension funds. Personal savings could be further explored, using lessons from pilot Community Municipal Bonds, and making investments eligible under Innovative Finance ISAs.

To support local investment pipelines, capital funding should include long-term low-cost loans offered on terms at least comparable with PWLB. Bundling projects into a net zero investment pipeline would enable financially attractive schemes to compensate for the less financially attractive ones, enabling investments like LED lighting to cross-subsidise 'harder', but necessary, interventions such as solid wall insulation. Borrowing needs to encompass both project finance and more flexible programme finance which can incorporate multiple projects. A package of projects increases investment size, attracting a wider group of investors.

Further research

This report has exemplified multiple clean energy and energy saving pilots, projects, programmes, and funding sources in making the case for investing in UK localities and regions to act on net zero carbon objectives. In addition to our Recommendations, further research is needed to understand better the synergies across net zero at the local scale encompassing energy efficiency retrofit, green district heating networks, public transport and EV charging infrastructure, smart, flexible and resilient local energy systems, and carbon stores in waters, forests and peatlands.

Research, policy and practice needs to dedicate attention to governing for net zero, including establishment of a more collaborative approach across scales of government and public sector. This includes work on a devolved regulatory and energy tax framework which is likely to be fundamental to governance for net zero carbon localities. Furthermore, in addition to other sources of finance not directly reviewed here, research is needed on the full range of investment models, types and sources which could finance net zero carbon localities, including joint ventures and private sector led-investment.

Endnotes

- 1 See for example New Zealand model (Ernst and Young, 2019).
- 2 See for example: Paris Pledge for Action; C40 Cities; ICLEI Local Governments for Sustainability; Global Covenant of Mayors for Climate and Energy; Covenant of Mayors for Climate and Energy; UK100.
- 3 Overview of Bristol City Council Climate Emergency activities. By February 2020, 281 of the UK's 408 local authorities had declared a Climate Emergency, as well as eight combined authorities/city regions.
- 4 See for example the Place-Based Climate Action Network (PCAN) analyses on emission reductions, cost saving and socio-economic benefits from local investment; Climate Commissions in Belfast, Edinburgh and Leeds are also accelerating local action.
- 5 The Committee on Climate Change recommended UK Government introduce a statutory duty for local authorities to 'develop and implement low-carbon plans' (CCC, 2012 p9); this was reinforced in their 2019 Net Zero Report (CCC, 2019). The House of Commons Science and Technology Committee (2019 p105) recommended 'The Government should introduce a statutory duty on local authorities in England and Wales, by Green Week 2020, to develop emissions reduction plans in line with the national targets set by the Climate Change Act'. Friends of the Earth (2019) recommendations included allocating local carbon budgets under a statutory duty 'to cut pollution in-line with the Climate Change Act'.
- 6 This encompassed electricity, gas, solid and liquid fuels across domestic, public and commercial buildings, transport and industry (Williamson et al., 2020).
- 7 Edinburgh is part of PCAN (see note 4). Analysis undertaken by PCAN on other local authority areas, including Leeds and Belfast, similarly suggests 50-65% of emissions reductions could be achieved by 2030 through cost-effective, net return investments.
- 8 There was a significant range of capital expenditure costs in this data (from under £1 million to over £50 million) accounting for the different size of individual networks as well as some projects being phased developments.
- 9 These figures are estimates. They are based on £1,000 per meter of installed heat network pipework and £1 million per 1MW of CHP capacity following discussion about capital expenditure costs with a district energy specialist. There are however a number of factors shaping the actual costs of individual heat network developments, such as whether it is a hard or soft dig, existing other underground infrastructure and utilities, and the types of building being connected (AECOM, 2015). Some costs could also come down under an expanded market (Carbon Trust, 2018).
- 10 In March 2019, PWLB loans were £77.5 billion and the 2018-19 year supported £9.131 billion in capital investments across 1,308 loans (Debt Management Office, 2019). Interest rates are set in relation to UK Government's overall cost of borrowing and have generally been low. The 1% interest rate rise in October 2019 was criticised by some as unnecessarily putting more marginal investments at risk (see e.g. Merrick, 2019; Local Government Association, 2020), although overall it is estimated that the majority of local authority borrowing will continue to be served by PWLB. To maintain the availability of loans, the lending limit has risen from £85bn to £95bn.
- 11 For further information about the Leeds PIPES network see www.leeds-pipes.co.uk/.

- 12 Figures are reported in Euros to the EIB and European Commission and we have followed suit given varying exchange rates. These figures may change as some local programmes are ongoing.
- 13 There are three categories of investment in the Elena programme: Sustainable Energy (leverage factor 20) includes energy efficiency, building-integrated renewables (such as solar panels), public lighting, district heating, CHP, biomass boilers, and smart grids for residential and non-residential buildings; Sustainable Transport (leverage factor 10); and Retrofit of Residential-only Buildings (leverage factor 10). Additional information about Elena and MLEI can be found in Energy Cities (2015) and Covenant of Mayors (2019).
- 14 In addition to Davis and Cartwright (2019) on community municipal bonds, for details on the differences between bonds, loans and shares in community financing of energy, see Brauholtz-Speight et al. 2018.
- 15 The Community Municipal Bonds trial is being supported with Horizon2020 funding, see www.socialres.eu.
- 16 There is some evidence that community investors are willing to invest at lower than market rates in local projects (see e.g. Davis and Cartwright, 2019; Brauholtz-Speight et al., 2020), although more research is needed on this, especially in relation to different routes to investing (including for example, if investments were eligible under innovative finance ISAs).
- 17 Shares of costs and benefits between localities and UK economy in such demonstrator projects need to be carefully monitored. There is debate about whether localities are able to secure anticipated long-term benefits proportionate to their share of risks from such investments (Brauholtz-Speight et al., 2018; Hawkey, Webb et al., 2016).
- 18 Further information about PFER. Additionally, for ReFLEX Orkney, see EMEC (2019); ProjectLEO; for Smart Hubs, see West Sussex County Council (2019). See the detailed designs; GreenSCIES also has its own website.
- 19 London Underground has undertaken an evaluation of all Tube vents in London. Six have been selected for development. One of these is east of the Woodberry Down development in Hackney, which includes a heat network. Proximity to a heat network may be one of the criteria for the selection of the six.
- 20 State aid rules need to be considered where there is potential for public funds to distort market competition. For the foreseeable future state aid rules are expected to continue, and a legal opinion on compliance when constructing finance for an initiative is important (BIS, 2015a). However, state aid is allowable in instances of market failure as in the low carbon sector, and block exemptions (such as those associated with 2014-2020 ERDF funding) where – pre-approved forms of state aid in specified areas – are in place. For Environmental Protection this includes eligible investments in energy efficiency in buildings, CHP, heat networks and renewables. For smaller investments, currently less than €200,000 over a 3-year fiscal period, De minimis – investments with a ‘negligible impact on trade and competition’ (BIS, 2015b p20) – may apply.
- 21 Within debates over ‘replacement’ funds to EU structural funding (for overview see Brien, 2019), concerns over the Towns Fund include that it falls short of funding levels which UK regions would receive as a member state (e.g. see Conference of Peripheral Maritime Regions).
- 22 During 2017-18, all 38 LEPs were awarded £50,000 each to develop local energy strategies. Summaries of local industrial strategies are also available along with individual strategies.
- 23 For example, ADE argue that public sector buildings should be required to connect to heat networks to support economic viability and reduce costs over the longer term. At present public sector buildings are compelled to procure the cheapest energy they can at the time. Connection to a heat network might not always be the cheapest at that moment (especially in cases of low carbon generation), but the more buildings and anchor loads (often public sector) that connect, the cheaper it becomes. Whole life time costs and climate impacts/carbon thus need to be used to calculate best price as impacts of climate disruption become more expensive to mitigate the later we leave it.

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Appendix

Table 1: Leveraging investment through UK Elna programmes

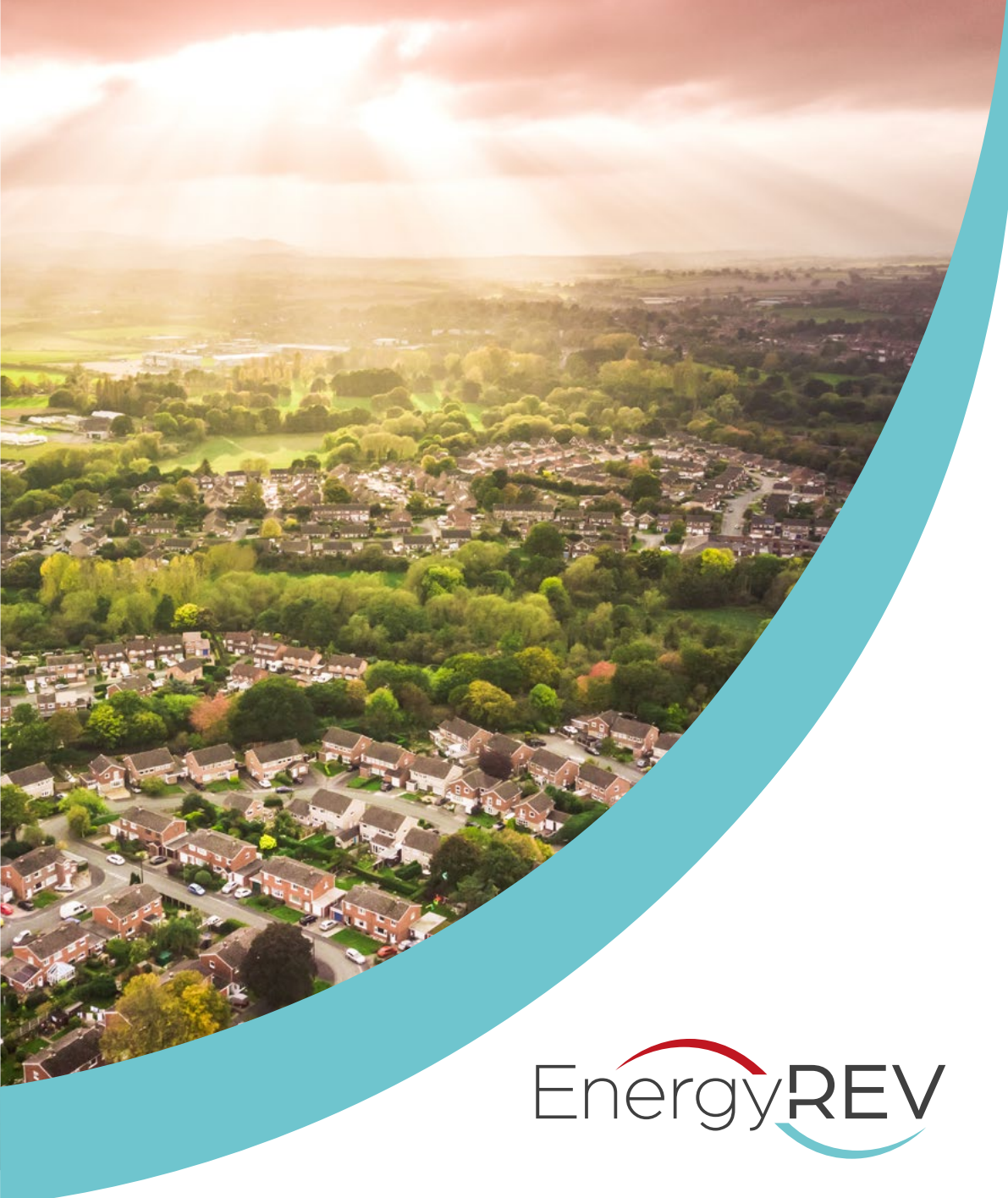
UK Elna programme	Lead organisation	Year started	EIB technical assistant grant	Total investment in technical assistance ^a	Investment in low carbon projects	Annual ^b			
						Local energy priorities	Energy savings GWh/yr	Heat &/or electricity generation GWh/yr	CO2 reduction tonne CO ₂ e
Birmingham Energy Savers Pathway	Birmingham City Council	2012	€552,798	€614,220	€38,820,000	Domestic energy retrofit	30.88	6.04	18,434
Bristol Retrofitting – Innovative Technologies for Everyone	Bristol City Council	2012	€2,332,229	€2,591,366	€64,000,000	Domestic energy retrofit; Heat networks; Public sector retrofit; Solar PV	19	26	9,053
South West Energy Unit	Bristol City Council	2018	€1,949,400	€2,166,000	€52,000,000	Domestic energy retrofit; EV charging & solar carports; Heat networks; Public sector retrofit; Solar PV; Street lighting	32	3.1	17,928
Cheshire East Energy Programme	Cheshire East Council	2017	€1,069,101	€1,187,890	€27,860,000	Heat networks; Street lighting; grid balancing grid during peak demands	11	-	2,181
Decentralised Energy London	Greater London Authority	2011	€2,904,744	€3,227,493	€142,600,000	Heat networks	-	-	43,904
RE:FIT	Greater London Authority	2011	€2,884,680	€3,205,199	€107,349,656	Energy performance contracting	76.27	1.84	23,720
London RE:NEW	Greater London Authority	2014	€3,016,440	€3,358,308	€102,000,000	Domestic energy retrofit	77.3	1.7	22,672

UK Elena programme	Lead organisation	Year started	EIB technical assistant grant	Total investment in technical assistance ^a	Investment in low carbon projects	Annual ^b			
						Local energy priorities	Energy savings GWh/yr	Heat &/or electricity generation GWh/yr	CO2 reduction tonne CO2e
Greater Manchester Low Carbon Delivery Unit	Greater Manchester Combined Authority	2015	€2,687,107	€2,985,675	€155,852,206	Heat networks; Street lighting	129	85	-
RE:FIT Wales	Local Partnerships Wales (Welsh Government)	2015	€2,005,404	€2,228,227	€53,200,000	Energy performance contracting	20.33	-	9,000
Energy Accelerator	West Yorkshire Combined Authority	2018	€3,513,847	€4,147,056	€115,000,000	Public sector retrofit; Domestic energy retrofit; Solar PV; Street lighting; Heat networks	47	1.3	25,081
Totals			€22,915,750	€25,711,434	€858,681,862		443 GWh	125 GWh	171,973

^a Elena funding recipients contribute 10% of costs to technical assistance.

^b For the ongoing programmes, these are estimated figures provided at the start of local programmes.

Source: Data extracted and compiled from individual local Elena programme factsheets published by EIB (2020a, 2020b).



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EnergyREV was established in 2018 (December) under the UK's Industrial Strategy Challenge Fund Prospering from the Energy Revolution programme. It brings together a team of over 50 people across 22 UK universities to help drive forward research and innovation in Smart Local Energy Systems.

EnergyREV is funded by UK Research and Innovation, grant number EP/S031863/1.



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